



Westinghouse Semiconductor Condensed Catalog



SUMMIT
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TRANSISTOR SPECIALISTS

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Westinghouse Electric Corporation
Semiconductor Division
Youngwood, Pennsylvania



This symbol now appears on all semiconductors that carry the Westinghouse Lifetime Guarantee. It means that the device is guaranteed for the life of the equipment in which it is installed. It's the only guarantee of its kind. After two years, no one else has matched it. Consider what the reliability level must be for a manufacturer to offer this kind of guarantee.

The quality that makes this lifetime guarantee possible is the big difference in semiconductors.

Westinghouse Semiconductor Lifetime Guarantee

Westinghouse warrants to the original purchaser that it will correct any defect or defects in workmanship, by repair or replacement f.o.b. factory, for any silicon power semiconductor bearing this symbol  during the life of the equipment in which it is originally installed, provided said device is used within manufacturer's published ratings and applied in accordance with good engineering practice. This warranty shall constitute a fulfillment of all Westinghouse liabilities in respect to said products. This warranty is in lieu of all other warranties expressed or implied. Westinghouse shall not be liable for any consequential damages.

transistors

Silicon Power Transistors	
7.5 amps through 30 amps	4
Alloy "OEM" Transistors	
6 amps through 20 amps	6
Diffused "OEM" Transistors	
7.5 amps through 30 amps	6

thyristors

High Voltage Thyristor Assemblies	7
High Power Thyristor Assemblies	7
Fast Switching Thyristors	
Gate Controlled Switch (GCS)	
Silicon Controlled Rectifiers (SCR)	
10 amps through 300 amps	7
Low Power Thyristors	
10 amps through 16 amps	8
Medium Power Thyristors	
35 amps through 70 amps	8
High Power Thyristors	
125 amps through 300 amps	8

rectifiers

Low Power Rectifiers	
.75 amps through 1.6 amps	10
Medium Power Rectifiers	
5 amps through 70 amps	10
Fast Switching Rectifiers	
1 amp through 35 amps	11
High Power Rectifiers	
70 amps through 500 amps	12
"OEM" Low Cost Rectifiers	
15 amps through 400 amps	12

rectifier assemblies

Single Phase and Three Phase Assemblies	
3.2 through 820 amps	14
Molded Assemblies	
2 amps through 12 amps	16
High Voltage Assemblies	17

Behind the Westinghouse Lifetime Guarantee	18
Technical Assistance	19
Westinghouse Sales Offices	19

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Westinghouse silicon transistors are designed for high power applications in industrial and high reliability military and space systems. They offer the outstanding advantages of freedom from thermal fatigue and second breakdown. Devices are 100% power tested. Each transistor is swept from rated voltage through its maximum power hyperbola to its maximum rated current. All production lots are tested in accordance with specification MIL-S-19500 to insure high reliability and performance. Procurement specifications

available on request document these tests. Such careful testing is another reason why these devices bear this Westinghouse Life-time Guarantee symbol.

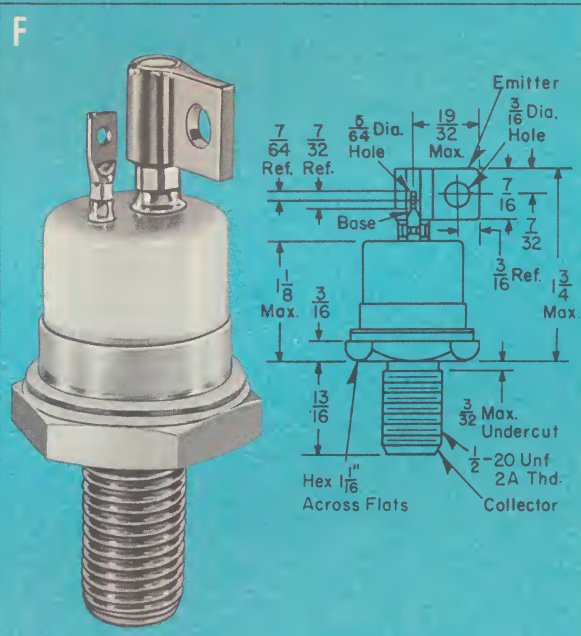
Transistors are grouped by maximum collector current ratings. Gain and saturation resistance limits apply at the collector currents as follows in the next line. Collector-base voltage ratings may be determined by adding V_{EC} and V_{EB} ratings. The values of V_{CE} specified are below the values of V_{CEX} , V_{CER} , V_{CES} , and V_{CEO} .

SILICON POWER TRANSISTORS

RATING	7.5 AMPS		7.5 AMPS	10 AMPS HIGH GAIN		10 AMPS HIGH GAIN		20 AMPS		
	A		B	A		C		D		
 Type	 107	 108	 113	 118		 120		 109		
@ I _C = h _{FE} min R _{SAT} max f _{tc} (typ)	2A 10 0.75 Ω 250	5A 10 0.50 Ω 250	5A 10 0.20 Ω 250	10A 100 0.35 Ω 500	10A 400 0.35 Ω 500	10A 100 0.35 Ω 500	10A 400 0.35 Ω 500	10A 10 0.15 Ω 200	15A 10 0.10 Ω 200	20A 10 0.075 Ω 200
V _{CE} 30 50 60 100 150 200 250	2N1015 2N1015A 2N1015B 2N1015C 2N1015D 2N1015E	2N1016 2N1016A 2N1016B 2N1016C 2N1016D 2N1016E	 2N3429 2N3430 2N3431 2N3432 2N3433	 2N2226 2N2227 2N2228 2N2229	 2N2230 2N2231 2N2232 2N2233	 2N3470 2N3471 2N3472 2N3473	 2N3474 2N3475 2N3476 2N3477	 2N2739 2N2740 2N2741 2N2742	 2N2739 2N2746 2N2747 2N2748	 2N2751 2N2752 2N2753 2N2754
MAXIMUM RATINGS	V _{EB} = 25V, I _B = 5A T _j = -65° to +150° PD = 150W @ 45° Case R _{THERMAL} = 0.7°C/Watt		V _{EB} = 25V, I _B = 3A T _j = -65° to +175° PD = 150W @ 60° Case R _{THERMAL} = 0.75°C/Watt	V _{EB} = 15V, I _B = 1A T _j = -65° to +150° PD = 150W @ 75° Case R _{THERMAL} = 0.5°C/Watt		V _{EB} = 15V, I _B = 1A T _j = -65° to +150° PD = 150W @ 75° Case R _{THERMAL} = 0.5°C/Watt		V _{EB} = 15V, I _B = 7.5A T _j = -65° to +175° PD = 200W @ 75° Case R _{THERMAL} = 0.5°C/Watt		
Data Sheet Reference	T.D. 54-661 pg. 1-2		T.D. 54-661 pg. 3-4	T.D. 54-663 pg. 1-4		T.D. 54-663 pg. 1-4		T.D. 54-661 pg. 9-12		

RATING	30 AMPS				30 AMPS			
	C				E F			
Type	110				115/125*			
@ $I_C =$ h_{FE} min R_{SAT} max f_{Tkc} (typ)	10A 10 0.15 Ω 200	15A 10 0.10 Ω 200	20A 10 0.075 Ω 200	25A 10 0.06 Ω 200	10A 10 0.15 Ω 200	15A 10 0.10 Ω 200	20A 10 0.075 Ω 200	25A 10 0.06 Ω 200
V_{CE} 50 100 150 200 250 300	2N2757 2N2758 2N2759 2N2760 2N2761	2N2763 2N2764 2N2765 2N2766	2N2769 2N2770 2N2771 2N2772	2N2775 2N2776 2N2777 2N2778	2N1809 2N1810 2N1811 2N1812 2N1813 2N1814	2N1816 2N1817 2N1818 2N1819 2N1820	2N1823 2N1823 2N1825 2N1826	2N1830 2N1831 2N1832 2N1833
MAXIMUM RATINGS	$V_{EB} = 15V$, $I_B = 7.5A$ $T_j = -65^\circ$ to $+175^\circ$ $PD = 200W$ @ 75° case $R_{THERMAL} = 0.5^\circ C/Watt$				$V_{EB} = 15V$, $I_B = 10A$ $T_j = -65^\circ$ to $+175^\circ$ $PD = 250W$ @ 60° case $R_{THERMAL} = 0.45^\circ C/Watt$			
Data Sheet Reference	T.D. 54-662 pg. 15-18				T.D. 54-662 pg. 1-4			

Note: numbers shown are case E. For case F, substitute 2N21XX for 2N18XX.



The Westinghouse "OEM Line" of economically priced transistors are designed expressly to meet the needs of original equipment manufacturers of commercial electronic apparatus.

Their low saturation resistance, high collector voltage, and high temperature characteristics make them ideally suited for use in regulators, power supplies, inverters, and ignition systems.

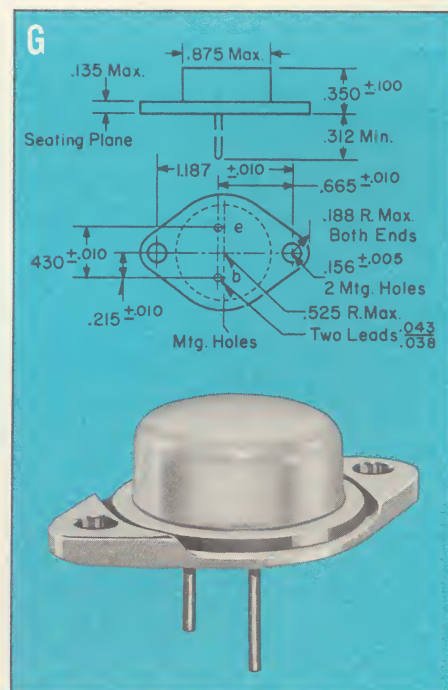
The diffused OEM devices supplied in the TO-3 (Photograph G) case also feature increased frequency capability.

ALLOY "OEM" TRANSISTORS

RATING	6 AMPS "OEM"		7.5 AMPS "OEM"		20 AMPS "OEM"	
	A		B		C	
Ⓢ Type	151	152	153	154	163	164
@ $I_C =$ $h_{FE} \text{ min}$ $R_{SAT} \text{ max}$ $f_{Tkc} \text{ (typ)}$	1.5A 11 0.86Ω 250	1.5A 18 0.83Ω 250	1.5A 15 0.86Ω 250	1.5A 25 0.83Ω 250	5A 15 0.22Ω 200	5A 25 0.20Ω 200
V_{CE} 40 60 80 100 120 140 160 180 200 220 240 260 280	151-04 151-06 151-08 151-10 151-12 151-14 151-16 151-18 151-20 151-22 151-24	152-04 152-06 152-08 152-10 152-12 152-14 152-16 152-18 152-20 152-22 152-24	153-04 153-06 153-08 153-10 153-12 153-14 153-16 153-18 153-20 153-22 153-24 153-26 153-28	154-04 154-06 154-08 154-10 154-12 154-14 154-16 154-18 154-20 154-22 154-24 154-26 154-28	163-04 163-06 163-08 163-10 163-12 163-14 163-16 163-18 163-20	164-04 164-06 164-08 164-10 164-12 164-14 164-16 164-18 164-20
MAXIMUM RATINGS	$V_{EB} = 25V$, $I_B = 3A$ $T_j = -65^\circ \text{ to } +150^\circ$ $PD = 100W @ 80^\circ \text{ case}$ $R_{THERMAL} = 0.7^\circ C/Watt$		$V_{EB} = 15V$, $I_B = 3A$ $T_j = -65^\circ \text{ to } +175^\circ$ $PD = 200W @ 25^\circ \text{ case}$ $R_{THERMAL} = 0.75^\circ C/Watt$		$V_{EB} = 15V$, $I_B = 7.5A$ $T_j = -65^\circ \text{ to } +175^\circ$ $PD = 200W @ 75^\circ \text{ case}$ $R_{THERMAL} = 0.5^\circ C/Watt$	
Data Sheet Reference	T.D. 54-672 pg. 1-2		T.D. 54-672 pg. 3-4		T.D. 54-672 pg. 5-6	

DIFFUSED "OEM" TRANSISTORS

RATING	UP TO 30 AMPS				
	G				
Ⓢ Type	156				
JEDEC	$I_C \text{ max}$	V_{CE}	$PD @ T_C = 25^\circ C$	$h_{FE} @ I_C$	$R_{SAT} \text{ max @ } I_C$
⬢ 2N3055	15A	60V	115W	20 @ 4A	$.275 \Omega @ 4A$
2N3232	7.5A	60V	117W	18 @ 3A	$.83 \Omega @ 3A$
2N3233	7.5A	100V	117W	18 @ 3A	$.83 \Omega @ 3A$
2N3234	7.5A	160V	117W	18 @ 3A	$.83 \Omega @ 3A$
2N3235	15A	55V	117W	20 @ 4A	$.275 \Omega @ 4A$
2N3442	10A	140V	117W	20 @ 3A	$.33 \Omega @ 3A$
Data Sheet Reference T.D. 54-663					
Ⓢ Type	158				
⬢ 2N3236	15A	90V	150W	17 @ 5A	$.22 \Omega @ 5A$
2N3237	20A	75V	200W	12 @ 10A	$.20 \Omega @ 10A$
2N3238	15A	80V	150W	8.5 @ 10A	$.33 \Omega @ 10A$
2N3239	15A	80V	150W	8.5 @ 10A	$.1 \Omega @ 10A$
2N3240	15A	160V	150W	8.5 @ 10A	$.1 \Omega @ 10A$
2N3771	30A	40V	150W	15 @ 15A	$.13 \Omega @ 15A$
2N3772	30A	60V	150W	15 @ 10A	$.14 \Omega @ 10A$
2N3773	30A	140V	150W	15 @ 8A	$.175 \Omega @ 8A$
Data Sheet Reference T.D. 54-673					



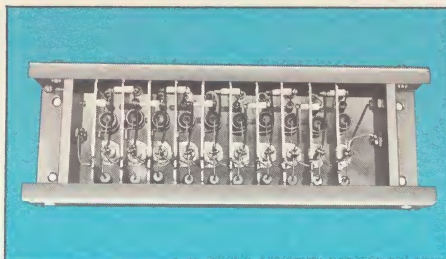


Westinghouse thyristors are characterized by unusually high reliability under severe operating conditions. Outstanding features of the devices include exclusive Westinghouse compression bonded encapsulation (CBE) or hard solder construction to withstand extreme ther-

mal variations. Center firing for high di/dt and high surge capabilities make possible control of maximum load KVA and optimum fuse coordination. Special parameters such as dv/dt, turn-off, turn-on, forward drop and 150°C junctions can be supplied on request.

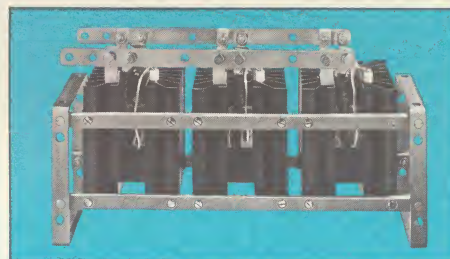
HIGH VOLTAGE THYRISTOR ASSEMBLIES

A wide range of custom designed high voltage thyristor assemblies are available by arranging in series any of the thyristor SCR or GCS devices. A typical GCS assembly utilizes unique slave firing action to turn off 10,000 volts in 4 to 10 microseconds for high voltage DC switching. Similarly a SCR assembly can easily turn-on 20,000 volts in 2 to 5 microseconds at currents from 1 to 300 amperes for high power AC control. Applications range from radar modulators to HVDC transmission.



HIGH POWER THYRISTOR ASSEMBLIES

Single and multiple phase control assemblies are available using any rating of thyristors and rectifiers. Single phase ratings to 600 amperes, three phase to 750 amperes and six phase with interphase to 1000 amperes are standard. Heat sinks, interconnections, and hardware are provided in one integral assembly. Custom designs for special packaging, transient suppression, and dv/dt protection can be supplied on request. Typical applications include adjustable power supplies and motor controls.



FAST SWITCHING THYRISTORS

These thyristor SCR and GCS devices are designed for efficient high speed switching and control through 25,000 Hz. Particular attention has been given to dynamic turn on and off times, dv/dt, di/dt, and thermal con-

struction to assure optimum performance. High efficiency DC control is possible using the GCS (Gate Controlled Switch) while AC control can utilize the features of both the SCR and GCS.

SCR types are listed by half-wave average current rating at 180 degree conduction angle.

Ratings shown apply at the case temperature indicated. Surge ratings are peak one-half cycle currents at 60 Hz. Voltage ratings are maximum steady state blocking voltages. Transient voltage ratings to higher voltages and other design parameters are shown on the technical data sheets.

GATE CONTROLLED SWITCHES (GCS)				
RATING		10 AMPS		
				
1A reverse gate pulse will turn off 4A, 6A, and 8A peak forward current in 5μSEC for  Types 242XA, 242YA, and 242ZA series respectively.				
volts 50	242XA	242YA	242ZA	
100	242XB	242YB	242ZB	
200	242XD	242YD	242ZD	
300	242XF	242YF	242ZF	
400	242XH	242YH	242ZH	
500	242XK	242YK	242ZK	
600	242XM	242YM	242ZM	
700	242XP	242YP	242ZP	
800	242XS	242YS	242ZS	
900	242XV	242YV	242ZV	
1000	242XZ	242YZ	242ZZ	
Data Sheet Reference		SA-9699		

SILICON CONTROLLED RECTIFIERS (SCR)					
RATING	35 AMPS	70 AMPS	125 AMPS	175 AMPS	300 AMPS
	IJ	IJ	K	K	N
@ TCASE I _{RMS} max I _{surge} toFF (max)	80°C 55A 500A 15μSEC	50°C 110A 750A 15μSEC	70°C 200A 2000A 20μSEC	60°C 275A 3000A 25μSEC	* 470A 3500A 30μSEC
(W) Type	✱ 213	✱ 212	✱ 2181	✱ 2201	✱ 2231
volts 50	213A	212A	2181A	2201A	2231A
100	213B	212B	2181B	2201B	2231B
200	213D	212D	2181D	2201D	2231D
300	213F	212F	2181F	2201F	2231F
400	213H	212H	2181H	2201H	2231H
500	213K	212K	2181K	2201K	2231K
600	213M	212M	2181M	2201M	2231M
800	213S	212S	2181S	2201S	2231S
900	213V	212V	2181V	2201V	2231V
1000	213Z	212Z	2181Z	2201Z	2231Z
Data Sheet Reference	T.D. 54-567 pg. 5-6	T.D. 54-567 pg. 7-8	T.D. 54-567 pg. 9-10	T.D. 54-567 pg. 11-12	T.D. 54-567 pg. 13-14

*Type 2231 is an integral heat sink design intended for forced air cooling. Refer to Data Sheet for ambient temperature ratings.

SCR types are listed by half-wave average current rating at 180 degree conduction angle. Ratings shown apply at the case temperature

indicated. Surge ratings are peak one-half cycle currents at 60 Hz. Voltage ratings are maximum steady state blocking voltages.

Transient voltage ratings to higher voltages and other design parameters are shown on the technical data sheets.

LOW POWER THYRISTORS

RATING	10 AMPS	10 AMPS	16 AMPS
	H	H	H
@ T _{CASE} I _{RMS} max I _{SURGE}	56°C 16A 125A	90°C 16A 125A	68°C 25A 150A
Ⓜ Type	✱ 202	✱ 203	✱ 201
volts 25	2N1842	2N1842A	2N681
50	2N1843	2N1843A	2N682
100	2N1844	2N1844A	2N683
150	2N1845	2N1845A	2N684
200	2N1846	2N1846A	2N685
300	2N1848	2N1848A	2N687
400	2N1849	2N1849A	2N688
500	2N1850	2N1850A	2N689
600	202M	293M	2N690
700	202P	203P	2N691
800	202S	203S	2N692
900	202V	203V	201V
1000	202Z	203Z	201Z
1100	202ZB		201ZB
1200	202ZD		201ZD
Data Sheet Reference	T.D. 54-563 pg. 1-2	T.D. 54-563 pg. 3-4	T.D. 54-564 pg. 1-4

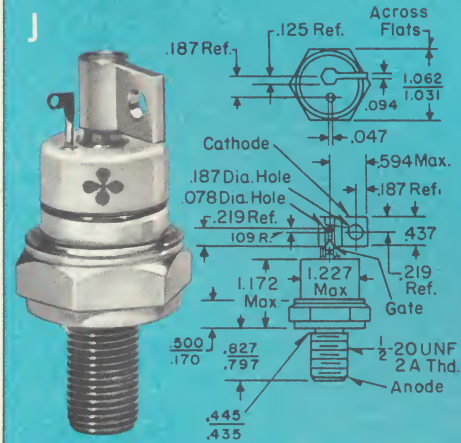
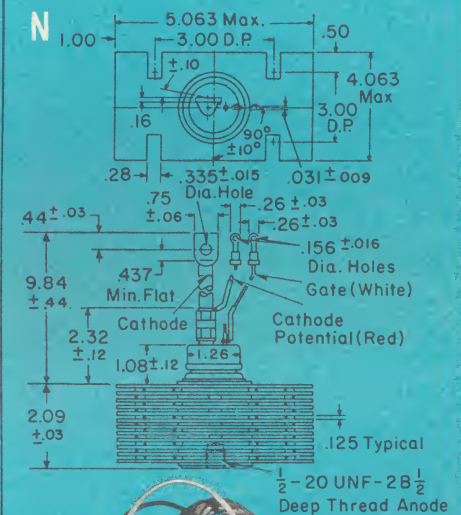
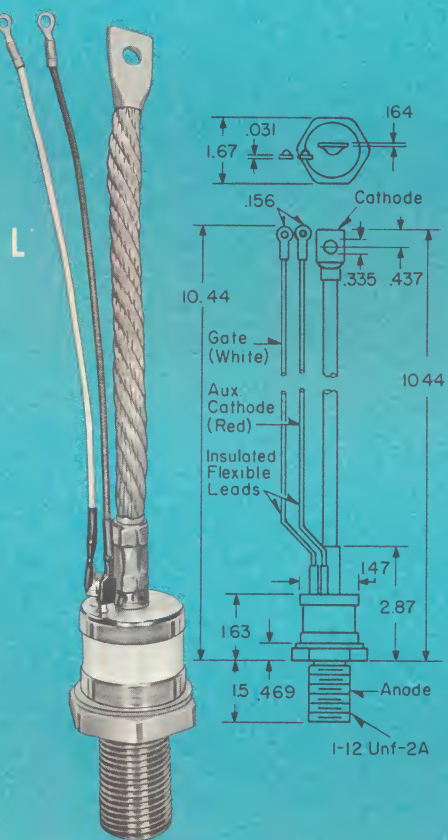
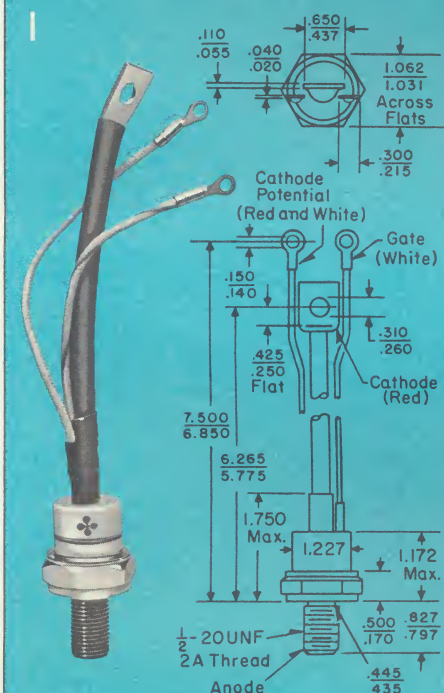
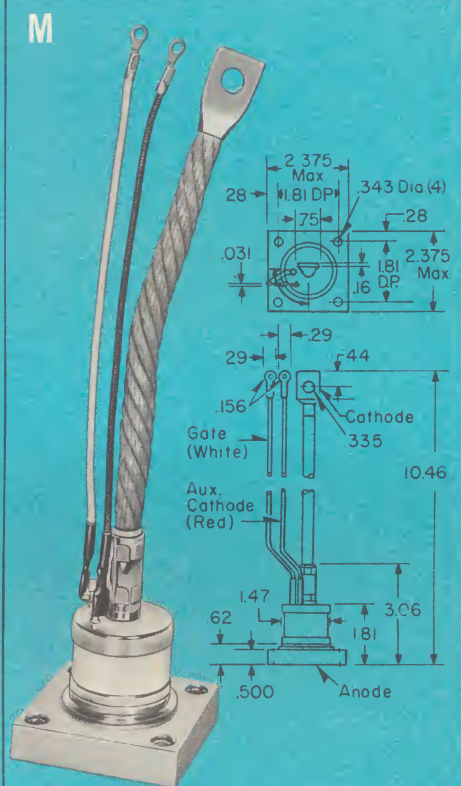
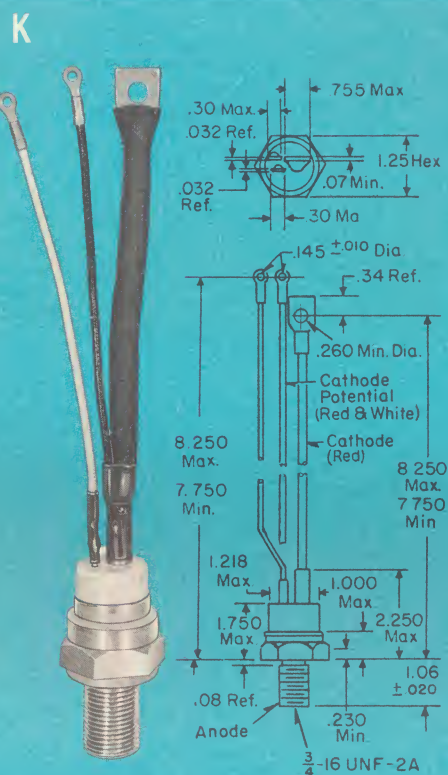
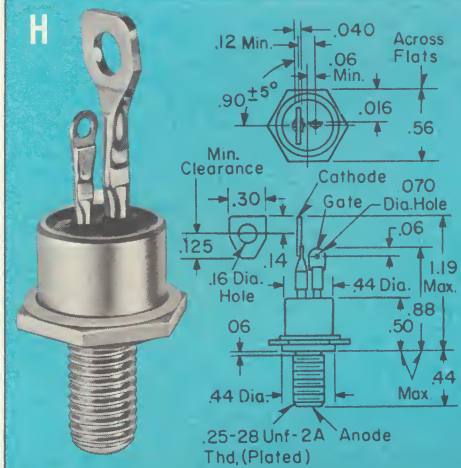
MEDIUM POWER THYRISTORS

RATING	35 AMPS	35 AMPS	70 AMPS	70 AMPS	70 AMPS
	IJ	IJ	IJ	I	IJ
@ T _{CASE} I _{RMS} max I _{SURGE}	89°C 55A 700A	100°C 55A 1100A	65°C 110A 1000A	86°C 110A 1000A	82°C 110A 1600A
Ⓜ Type	✱ 211/209	✱ 219	✱ 809	✱	✱ 254
volts 25	.....	.....	2N1909 809U51	2N2023	.....
50	211A 209A	219A	2N1910 2N1792	2N2023	254A 254A
100	211B 209B	219B	2N1911 2N1793	2N2025	2N4361 2N4371
150	211C 209C	219C	2N1912 2N1794	2N2026	.....
200	211D 209D	219D	2N1913 2N1795	2N2027	2N4365 2N4372
300	211F 209F	219F	2N1915 2N1797	2N2029	254F 254F
400	211H 209H	219H	2N1916 2N1798		2N4363 2N4373
500	211K 209K	219K	2N1805 2N1799		254K 254K
600	211M 209M	219M	2N1806 2N1800		2N4364 2N4374
700	211P 209P	219P	809P 2N1801		254P 254P
800	211S 209S	219S	809S 2N1802		2N4365 2N4375
900	211V 209V	219V	809V 2N1803		254V 254V
1000	211Z 209Z	219Z	809Z 2N1804		2N4366 2N4376
1100	211ZB 209ZB	219ZB	809ZB 809ZB51		254ZB 254ZB
1200	211ZD 209ZD	219ZB	809ZD 809ZD51		2N4367 2N4377
1300					254ZF 254ZF
1400					2N4368 2N4378
Data Sheet Reference	T.D. 54-565 pg. 1-2	T.D. 54-565 pg. 3-4	T.D. 54-566 pg. 1-2	.....	T.D. 54-566 pg. 3-4

HIGH POWER THYRISTORS

RATING	125 AMPS	175 AMPS	250 AMPS	250 AMPS	250 AMPS	300 AMPS
K	K	K	L	M	N	N
@ T _{CASE} I _{RMS} max I _{SURGE}	86°C 200A 3500A	83°C 275A 4500A	80°C 400A 5000A	80°C 400A 5000A	* 400A 5000A	* 470A 5000A
Ⓜ Type	✱ 218	✱ 220	✱ 221	✱ 224	✱ 222	✱ 223
volts 50	218A	2N3884	2N3353	224A	2N3530	223A
100	218B	2N3885	2N3354	224B	2N3531	223B
150	218C	220C	221C	224C	222C	223C
200	218D	2N3886	2N3355	224D	2N3522	223D
300	218F	2N3887	2N3356	224F	2N3533	223F
400	218H	2N3888	2N3357	224H	2N3534	223H
500	218K	2N3889	2N3358	224K	2N3535	223K
600	218M	2N3890	2N3359	224M	2N3536	223M
700	218P	2N3891	2N3360	224P	2N3537	223P
800	218S	2N3892	2N3361	224S	2N3538	223S
900	218V	2N3893	2N3362	224V	2N3539	223V
1000	218Z	2N3894	2N3363	224Z	2N3540	223Z
1100	218ZB	220ZB	221ZB	224ZB	222ZB	223ZB
1200	218ZD	2N3895	2N3364	224ZD	2N3541	223ZD
Data Sheet Reference	T.D. 54-567 pg. 1-2	T.D. 54-568 pg. 1-2	T.D. 54-569	T.D. 54-569	T.D. 54-569 pg. 3-4	T.D. 54-569 pg. 5-6

*Type 222 and 223 are integral heat sink design intended for forced air cooling. Refer to Data Sheet for ambient temperature ratings.

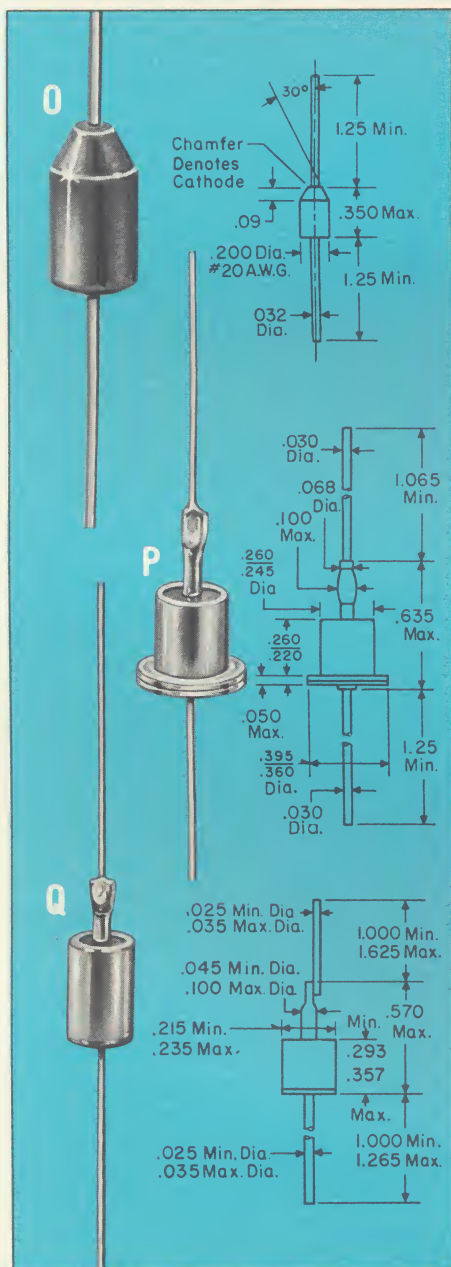




Low power lead mounted rectifiers are now available in hermetic epoxy encapsulation as well as in the well known metal cases. The hermeticity of epoxy rectifiers is assured by humidity tests per MIL-S-750 method 1021. The versatile 1N4816 series can be used to replace nearly all silicon rectifiers with current ratings up to 1.5 amps and reverse voltage ratings of 50 to 1000 volts.

Westinghouse medium and high power

LOW POWER RECTIFIERS



RATING	1.5 AMPS	.75 AMPS	1.6 AMPS	1.0 AMPS	1.0 AMPS
	O	P	P	Q	Q
	@ 40°C Amb. 50A surge	@ 50°C Amb. *35°C, †30°C •.6A @ 30°C 15A surge	@ 140°C case 25A surge	50°C Amb. 35A surge	FAST SWITCHING T _{rr} =100ns† 50°C Amb. 35A surge
Ⓜ Type	✱ 359	✱ 380	✱ 380	✱ 385*	✱ 386
volts 50	1N4816	1N536	1N1217B	385A	386-1AY
100	1N4817	1N537	1N1218B	385B	1N5004
150	.....	.....	1N1219B	385C	386-1CY
200	1N4818	1N538	1N1220B	385D	1N5005
300	1N4819	1N539	1N1221B	385F	386-1FY
400	1N4820	1N540	1N1222B	385H	1N5006
500	1N4821	*1N1095	1N1223B	385K	386-1KY
600	1N4822	†1N1096	1N1224B	385M	1N5007
600	.....	1N547	.....	.....	.....
700	1N5052	.....	1N1225B	385P	.....
800	1N5053	.....	1N1226B	385S	.....
1000	1N5054	•1N560 •1N561	1N1443B	385Z	.....
Data Sheet Reference	T.D. 54-161 pg. 3-4	T.D. 54-161 pg. 5-6	T.D. 54-161 pg. 1-2	T.D. 54-161 pg. 7-8	T.D. 54-161 pg. 9-10

MEDIUM POWER RECTIFIERS

RATING	5 AMPS	6 AMPS	12 AMPS	15 AMPS
	R	R	R	S
@ T _{case} I _{surge}	150°C 25A	150°C 150A	150°C 240A	150°C 250A
Ⓜ Type	✱	✱ 441, 446	✱ 404, 437	703
volts 50	1N1612	1N1341A, AR	1N1199A, B, AR, BR	703A, AR
100	1N1613	1N1342A, AR	1N1200A, B, AR, BR	703B, BR
150	.....	1N1343A, AR	1N1201A, B, AR, BR	703C, CR
200	1N1614	1N1344A, AR	1N1202A, B, AR, BR	703D, DR
300	.....	1N1345A, AR	1N1203A, B, AR, BR	703F, FR
400	1N1615	1N1346A, AR	1N1204A, B, AR, BR	.....
500	.....	1N1347A, AR	1N1205A, B, AR, BR	.....
600	1N1616	1N1348A, AR	1N1206A, B, AR, BR	.....
700	.....	441P, 446P	404P, 437P	.....
800	.....	441S, 446S	404S, 437S	.....
900	.....	441V, 446V	404V, 437V	.....
1000	.....	441Z, 446Z	404Z, 437Z	.....
Data Sheet Reference	.....	T.D. 54-162 pg. 9-10	T.D. 54-162 pg. 11-12	T.D. 54-163 pg. 5-6

†80 and 120 nanosecond reverse recovery time devices are available.
*The following JEDEC devices can also be supplied: 1N2610-17, 1N3189-91

Bold Face Listings Military Types Available



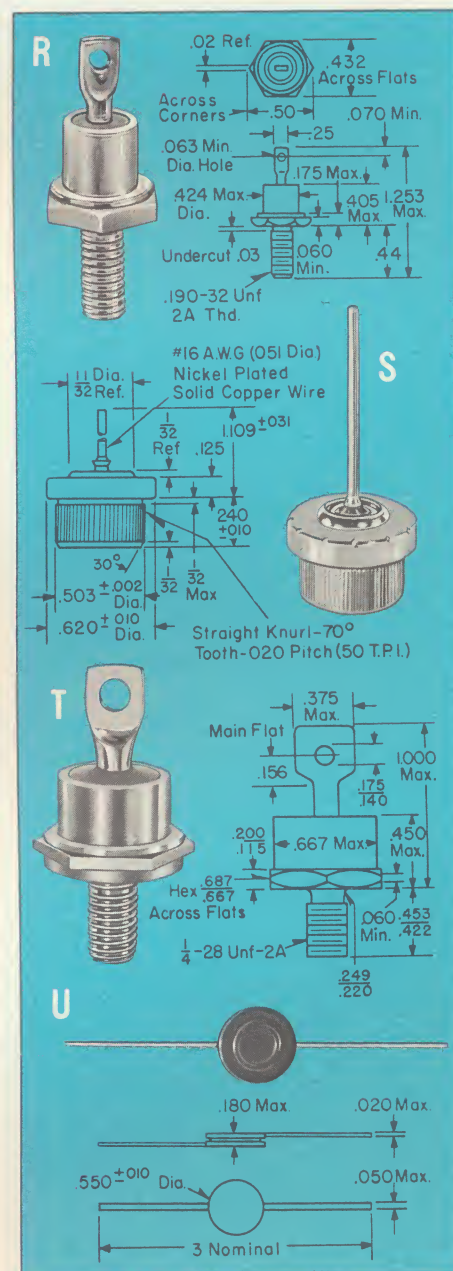
rectifiers feature high ambient temperature capability, long life, high efficiency, rugged construction, and freedom from thermal fatigue. As a result, Westinghouse rectifiers have established a record of reliability unequalled in the industry.

To obtain all the advantages of technical excellence, competitive prices, and guaranteed reliability, specify the Lifetime Guaranteed rectifier marked by this symbol.

Rectifiers are grouped by half wave average current ratings. Ratings shown apply at case temperatures indicated. All surge ratings are peak one-half cycle currents at 60 Hz. Surge ratings apply at maximum load. Voltage ratings shown are repetitive peak reverse maximum values. Most units have somewhat higher transient ratings. Reverse polarity JEDEC types are designate "R". On non-JEDEC types, the second listing designates reverse polarity.

MEDIUM POWER RECTIFIERS (continued)

RATING	18 AMPS	20 AMPS	25 AMPS	35 AMPS	40 AMPS	70 AMPS
	T	T	T	T	T	T
@ TCASE ISURGE	145°C 220A	150°C 250A	150°C 400A	140°C 500A	150°C 1000A	100°C 1000A
Type	303, 336		302	302, 335	402, 435	416
volts 50 100 150 200 300 400 500 600 700 800 900 1000	1N1191, R 1N1192, R 1N1193, R 1N1194, R 1N1195, R 1N1196, R 1N1197, R 1N1198, R	1N248, A, B 1N249, A, B 1N250, A, B 1N2135A	1N2154, R 1N2155, R 1N2156, R 1N2157, R 1N2158, R 1N2159, R 1N2160, R	1N1183, R 1N1184, R 1N1185, R 1N1186, R 1N1187, R 1N1188, R 1N1189, R 1N1190, R	1N1183A, AR 1N1184A, AR 1N1185A, AR 1N1186A, AR 1N1187A, AR 1N1188A, AR 1N1189A, AR 1N1190A, AR 402P, 435P 402S, 435S 402V, 435V 402Z, 435Z	416A, AR 416B, BR 416C, CR 1N4136, R 416F, FR 1N4137, R 416K, KR 1N4138, R 416P, PR 416S, SR 416V, VR 416Z, ZR
Data Sheet Reference	T.D. 54-163 pg. 1-2	.....	.....	T.D. 54-164 pg. 1-2	T.D. 54-164 pg. 3-4	.....



FAST SWITCHING RECTIFIERS

RATING	6 AMPS	6 AMPS	12 AMPS	12 AMPS	20 AMPS	35 AMPS
	U	R	R	U	T	T
@ TCASE ISURGE Recovery Time	125°C 150A 100 ns	140°C 200A 200 ns	140°C 300A 200 ns	130°C 200A 100 ns	100°C 300A 200 ns	100°C 500A 200 ns
Type	378	478	479	379	387	389
volts 50 100 150 200 300 400 500 600	378A 378B 378C 378D 378F 378H	1N3879 1N3880 478C 1N3881 1N3882 1N3883	1N3889 1N3890 479C 1N3881 1N3892 1N3893 479K 479M	379A 379B 379C 379D 379F 379H	1N3899 1N3900 387C 1N3901 1N3902 1N3903	1N3909 1N3910 389C 1N3911 1N3912 1N3913
Data Sheet Reference	T.D. 54-162 pg. 23-24	T.D. 54-162 pg. 21-22	T.D. 54-162 pg. 19-20	T.D. 54-162 pg. 17-18	T.D. 54-164 pg. 9-10	T.D. 54-164 pg. 7-8

HIGH POWER RECTIFIERS

RATING	70 AMPS	100 AMPS	125 AMPS	150 AMPS	160 AMPS	240 AMPS	275 AMPS	500 AMPS
	V	W	W	W	X	Y	Y	Z
@ TCASE ISURGE	150°C 1200A	130°C 2300A	130°C 3000A	110°C 3000A	125°C 2000A	125°C 3000A	120°C 5000A	120°C 9000A
Ⓜ Type	♣ 300	♣ 400	♣ 400	♣ 400	♣ 429	♣ 439	♣ 770	♣ 551
volts 50	1N1396	.....	400A, 401A	.....	1N3260, R	1N3161, R	1N4044, R	551A
100	1N1397	1N3288, AR	400B, 401B	1N4587	1N3261, R	1N3162, R	1N4045, R	551B
150	1N1398	.....	400C, 401C	.....	1N3262, R	1N3163, R	1N4046, R	551C
200	1N1399	1N3289, AR	400D, 401D	1N4588	1N3263, R	1N3164, R	1N4047, R	551D
250	.....	.....	.....	.....	1N3264, R	1N3165, R	1N4048, R	.....
300	1N1400	1N3290, AR	400F, 401F	1N4589	1N3265, R	1N3166, R	1N4049, R	551F
350	.....	.....	.....	.....	1N3266, R	1N3167, R	.....	.....
400	1N1401	1N3291, AR	400H, 401H	1N4590	1N3267, R	1N3168, R	1N4050, R	551H
500	1N1402	1N3292, AR	400K, 401K	1N4591	1N3268, R	1N3169, R	1N4051, R	551K
600	1N1403	1N3293, AR	400M, 401M	1N4592	1N3269, R	1N3170, R	1N4052, R	551M
700	.....	.....	400P, 401P	.....	1N3270, R	1N2171A, AR	1N4053, R	551P
800	.....	1N3294, AR	400S, 401S	1N4593	1N3271, R	1N3172A, AR	1N4045, R	551S
900	.....	.....	400V, 401V	.....	1N3272, R	1N3173A, AR	1N4055, R	551V
1000	.....	1N3295, AR	400Z, 401Z	1N4594	1N3273, R	1N3174A, AR	1N4056, R	551Z
1200	.....	.....	.....	1N4595	1N3274, R	.....	770ZD, R	.....
1400	.....	.....	.....	1N4596	1N3275, R	.....	760ZH, R*	.....
1600	.....	.....	.....	.....	1N3276, R	.....	760ZM, R*	.....
Data Sheet Reference	T.D. 54-165 pg. 1-2	T.D. 54-166 pg. 1-2	T.D. 54-166 pg. 1-2	T.D. 54-166 pg. 3-4	T.D. 54-167 pg. 1-2	T.D. 54-168 pg. 5-8	T.D. 54-168 pg. 1-2	.....

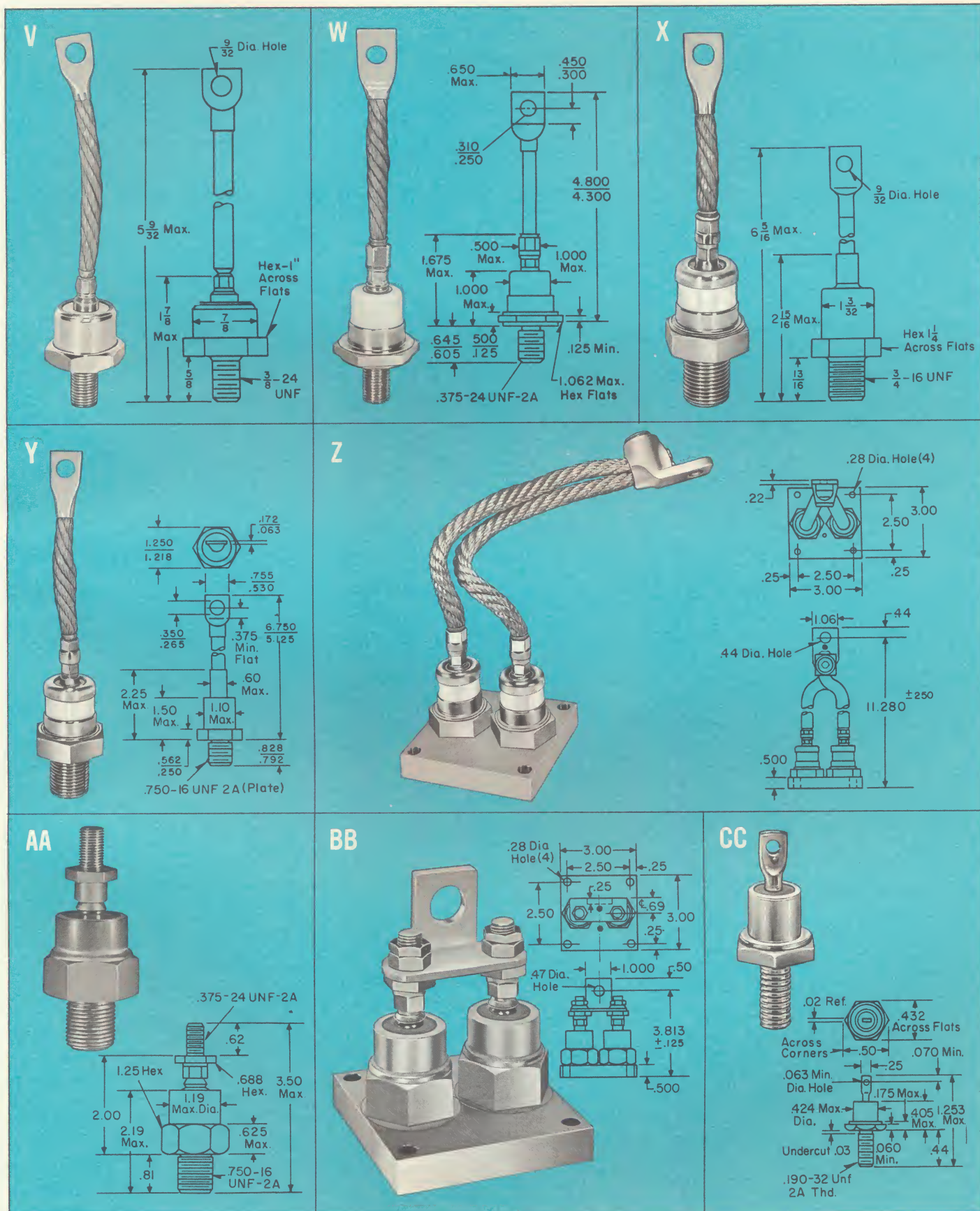
Bold Face Listing Military Types Available

*240A @ 100°C

"OEM" LOW COST RECTIFIERS

"OEM" rectifiers can be used to replace selenium, press fit and other silicon rectifier types in commercial and industrial applications, such as power supplies and battery chargers. These devices provide silicon performance and reliability and stud package convenience at lowest possible cost.

RATING	15 AMPS	160 AMPS	240 AMPS	400 AMPS
	CC	AA	AA	BB
@ TCASE ISURGE	125°C 200A	110°C 2000A	100°C 3000A	100°C 7000A
Ⓜ Type	368	376	377	550
volts 50	368A	376A	377A	550A
100	368B	376B	377B	550B
150	368C	376C	377C	550C
200	368D	376D	377D	550D
300	368F	376F	377F	550F
400	368H	376H	377H	550H
500	368K	376K	377K	550K
600	368M	376M	377M	550M
Data Sheet Reference	T.D. 54-172 pg. 5-6	T.D. 54-177 pg. 1-2	T.D. 54-178 pg. 1-2	.....

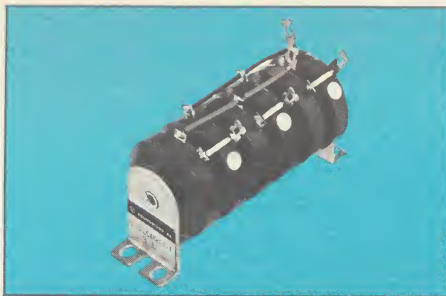


rectifier assemblies

Westinghouse silicon rectifier assemblies are available in all popular circuit configurations and a wide range of ratings. Aluminum extrusions or nickel-plated copper plates are used to insure long operating life and extended reliability.

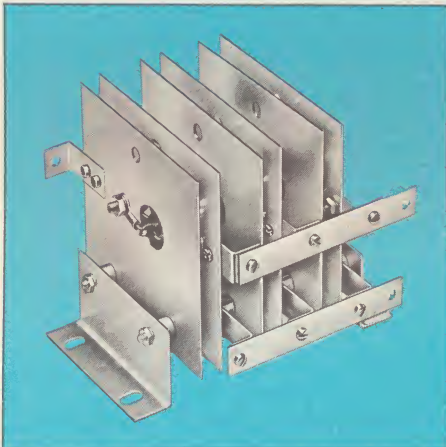
The following tabulation covers all standard current ranges and the most popular peak inverse voltage ratings of Westinghouse silicon rectifier assemblies in single phase full wave and three phase full wave configurations.

For your convenience, the listings are grouped by circuit configurations and listed in ascending order of output current and PRV.

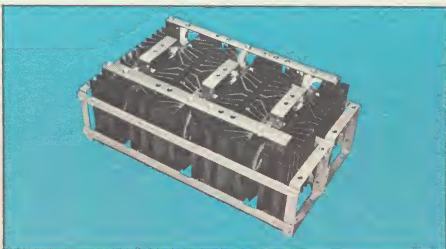


DIMENSIONS

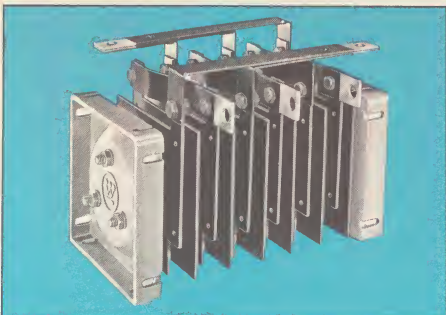
	L	W	H
1	3 $\frac{3}{32}$	1 $\frac{1}{32}$	2 $\frac{3}{8}$
2	4 $\frac{1}{32}$	1 $\frac{1}{32}$	2 $\frac{3}{8}$



3	4 $\frac{1}{32}$	4 $\frac{1}{4}$	3 $\frac{1}{32}$
4	5 $\frac{1}{16}$	4 $\frac{1}{4}$	3 $\frac{1}{32}$
5	4 $\frac{1}{32}$	4 $\frac{1}{4}$	3 $\frac{1}{32}$
6	5 $\frac{1}{16}$	4 $\frac{1}{4}$	3 $\frac{1}{32}$
7	5 $\frac{3}{4}$	6 $\frac{1}{4}$	5 $\frac{29}{32}$
8	7 $\frac{1}{32}$	6 $\frac{1}{4}$	5 $\frac{29}{32}$
9	10 $\frac{1}{8}$	6 $\frac{1}{4}$	5 $\frac{7}{8}$
10	13 $\frac{7}{8}$	6 $\frac{3}{8}$	5 $\frac{7}{8}$
11	10 $\frac{1}{8}$	8 $\frac{1}{4}$	7 $\frac{7}{8}$
12	13 $\frac{7}{8}$	8 $\frac{3}{8}$	7 $\frac{7}{8}$
13	11 $\frac{1}{4}$	9 $\frac{1}{16}$	8 $\frac{3}{8}$
14	15 $\frac{7}{8}$	9 $\frac{3}{4}$	8 $\frac{3}{8}$



15	13 $\frac{1}{4}$	11 $\frac{3}{4}$	8 $\frac{7}{8}$
16	18 $\frac{7}{8}$	11 $\frac{3}{4}$	8 $\frac{7}{8}$



17	7 $\frac{1}{16}$	8 $\frac{1}{2}$	7 $\frac{1}{4}$
18	10 $\frac{1}{16}$	6 $\frac{1}{2}$	7 $\frac{1}{4}$
19	7 $\frac{1}{16}$	8 $\frac{1}{2}$	9 $\frac{1}{4}$
20	10 $\frac{3}{16}$	8 $\frac{1}{2}$	9 $\frac{1}{4}$
21	11 $\frac{3}{16}$	8 $\frac{1}{2}$	9 $\frac{1}{4}$
22	15 $\frac{7}{16}$	8 $\frac{1}{2}$	9 $\frac{1}{4}$



SILICON RECTIFIER ASSEMBLIES

			SINGLE PHASE FULL WAVE					THREE PHASE FULL WAVE			
RATING	Maximum PRV		* Surge Amps	Average Forward Current		Style Number	Dimensions	Average Forward Current		Style Number	Dimensions
	Rep.	▲ Non- Rep.		◆ Natural Convection	■ Forced Air			◆ Natural Convection	■ Forced Air		
up to 4.8 AMPS (ref. T.D. 54-361)	200 400 600 800 1000	300 525 800 1000 1200	50 50 50 50 50	3.2 3.2 3.2 3.2 3.2	3.2 3.2 3.2 3.2 3.2	509C901G04 509C901G06 509C901G08 509C901G10 509C901G12	1	4.8 4.8 4.8 4.8 4.8	4.8 4.8 4.8 4.8 4.8	509C902G04 509C902G06 509C902G08 509C902G10 509C902G12	2
up to 18 AMPS (ref. T.D. 54-362)	200 400 600 800 1000	350 600 800 1000 1200	150 150 150 150 150	9.0 9.0 9.0 9.0 9.0	11.5 11.5 11.5 11.5 11.5	320C039G64 320C039G68 320C039G72 320C039G74 320C039G76	3	14.5 14.5 14.5 14.5 14.5	18 18 18 18 18	320C040G64 320C040G68 320C040G72 320C040G74 320C040G76	4
up to 36 AMPS (ref. T.D. 54-362)	200 400 600 800 1000	350 600 800 1000 1200	240 240 240 240 240	20 20 20 20 20	24 24 24 24 24	320C039G24 320C039G28 320C039G32 320C039G34 320C039G36	5	29 29 29 29 29	36 36 36 36 36	320C040G24 320C040G28 320C040G32 320C040G34 320C040G36	6
up to 105 AMPS (ref. T.D. 54-364)	200 400 600 800 1000	300 525 800 1000 1200	1000 1000 1000 1050 1300	42 42 42 42 42	70 70 70 70 70	320C044G54 320C044G56 320C044G58 320C044G60 320C044G62	7	62 62 62 62 62	105 105 105 105 106	320C048G54 320C048G56 320C048G58 320C048G60 320C048G62	8
up to 210 AMPS (ref. T.D. 54-365)	200 400 600 800 1000	300 525 800 1050 1300	3000 3000 3000 3000 3000	76 76 76 76 76	140 140 140 140 140	507C565G5D 507C565G5H 507C565G5M 507C565G5S 507C565G5Z	9	113 113 113 113 113	210 210 210 210 210	507C567G5D 507C567G5H 507C567G5M 507C567G5S 507C567G5Z	10
up to 370 AMPS (ref. T.D. 54-367)	200 400 600 1000 1600	300 525 800 1300 2000	2000 2000 2000 2000 2000	210 210 210 210 210	240 240 240 240 240	508C659G24 508C659G28 508C659G30 508C659G34 508C659G37	11	170 170 170 170 170	350 350 350 350 350	508C658G24 508C658G28 508C658G30 508C658G34 508C658G37	12
up to 460 AMPS (ref. T.D. 54-368)	200 400 600 1000 1600	300 525 800 1300 2000	2000 2000 2000 2000 2000	230 230 230 230 230	320 320 320 320 320	509C519G54 509C519G58 509C519G62 509C519G70 509C519G76	13	340 340 340 340 340	460 460 460 460 460	509C514G64 509C514G68 509C514G72 509C514G80 509C514G86	14
up to 765 AMPS (ref. T.D. 54-368)	200 400 600 1000 1200	300 525 800 1300 1600	5000 5000 5000 5000 5000	410 410 410 410 410	550 550 550 550 550	509C519G04 509C519G08 509C519G12 509C519G20 509C519G22	15	580 580 580 580 580	765 765 765 765 765	509C514G04 509C514G08 509C514G12 509C514G20 509C514G22	16
up to 680 AMPS (ref. Compact Rectifier Assembly)	100 200 300 400 500 600	200 300 400 525 650 800	5000 5000 5000 5000 5000 5000	170 170 170 170 170 170	440 440 440 440 440 440	509C561G01 509C561G02 509C561G03 509C561G04 509C561G05 509C561G06	17	220 220 220 220 220 220	610 610 610 610 610 610	509C560G01 509C560G02 509C560G03 509C560G04 509C560G05 509C560G06	18
up to 790 AMPS (ref. Compact Rectifier Assembly)	100 200 300 400 500 600	200 300 400 525 650 800	5000 5000 5000 5000 5000 5000	245 245 245 245 245 245	510 510 510 510 510 510	509C561G09 509C561G10 509C561G11 509C561G12 509C561G13 509C561G14	19	340 340 340 340 340 340	710 710 710 710 710 710	509C560G09 509C560G10 509C560G11 509C560G12 509C560G13 509C560G14	20
up to 820 AMPS (ref. Compact Rectifier Assembly)	100 200 300 400 500 600	200 300 400 525 650 800	5000 5000 5000 5000 5000 5000	300 300 300 300 300 300	550 550 550 550 550 550	509C561G17 509C561G18 509C561G19 509C561G20 509C561G21 509C561G22	21	430 430 430 430 430 430	820 820 820 820 820 820	509C560G17 509C560G18 509C560G19 509C560G20 509C560G21 509C560G22	22

* Maximum allowable peak one cycle surge current at maximum rated conditions. (60 Hz base)
 ◆ Maximum rating of assemblies @ 40°C ambient temperature with natural convection cooling.
 ■ Maximum rating of assemblies @ 40°C ambient temperature with 1,000 linear feet per minute forced air cooling.
 ▲ Consists of one single-phase, half wave 60-cycle sinusoidal pulse of this peak value.

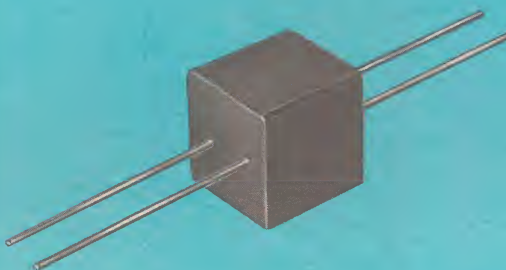
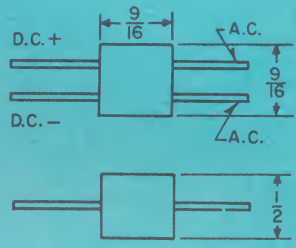
molded rectifier assemblies

Designers are realizing cost reductions through the use of transfer molded single phase full wave bridges in power supplies. These rugged epoxy molded case assemblies are beneficial in any applications where a bridge circuit is used, even in extreme environments associated with radar, sonar, space, and shipboard applications. Identical configurations provide easy installation and replacement.

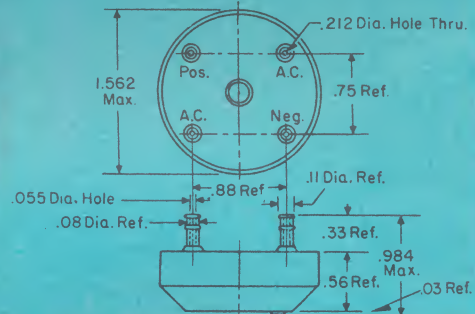
These single phase full wave bridges are grouped by ampere ratings based on $T_c = 25^\circ\text{C}$ and are available in ratings from 50 volts.

2 AMPS

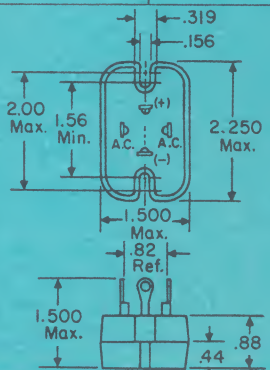
PRV/Diode	Style Number	PRV/Diode	Style Number
200	509C930H13	600	509C930H17
400	509C930H15	1000	509C930H21

2 AMPS		4 AMPS	
PRV/Diode	Style Number	PRV/Diode	Style Number
200	509C916H14	200	509C916H74
400	509C916H16	400	509C916H76
600	509C916H18	600	509C916H78
1000	509C916H22	1000	509C916H82

10 AMPS		12 AMPS	
PRV/Diode	Style Number	PRV/Diode	Style Number
50	509C927H41	200	509C927H54
100	509C927H42	400	509C927H58
150	509C927H43	600	509C927H60
200	509C927H44		



high voltage silicon rectifier assemblies

With voltage ratings to 156KV and three phase current ratings to 210 amperes, Westinghouse Silicon Rectifier Stacks have proven their outstanding reliability in over 50 million stack hours of failure free operation. Each cell is shunted with a capacitor and resistor which provide the optimum in steady state and transient voltage division. The stack can be designed for cooling by oil, convection or forced air, convection and vapor atmospheres. Where required, assemblies can be supplied with mil-type capacitors and resistors which, combined with the high temperature characteristics of the hermetically sealed silicon rectifier cells, allows operation in ambients up to 110°C. Use of these stacks in place of vacuum tubes will increase equipment efficiency by as much as 25%.

Ratings are based on forced air cooling of 1000 l fpm at 25°C ambient. Oil cooling will increase ratings. Assemblies are designed to meet most standard military environmental conditions. For very high voltage applications, corona shielding is available. Where voltage will allow, entire rectifier assemblies can be packaged in one channel.

High Voltage Rectifier Assembly. Available in single phase up to 140 Amps and three phase up to 210 Amps and to any desired voltage. 508C696 Series.

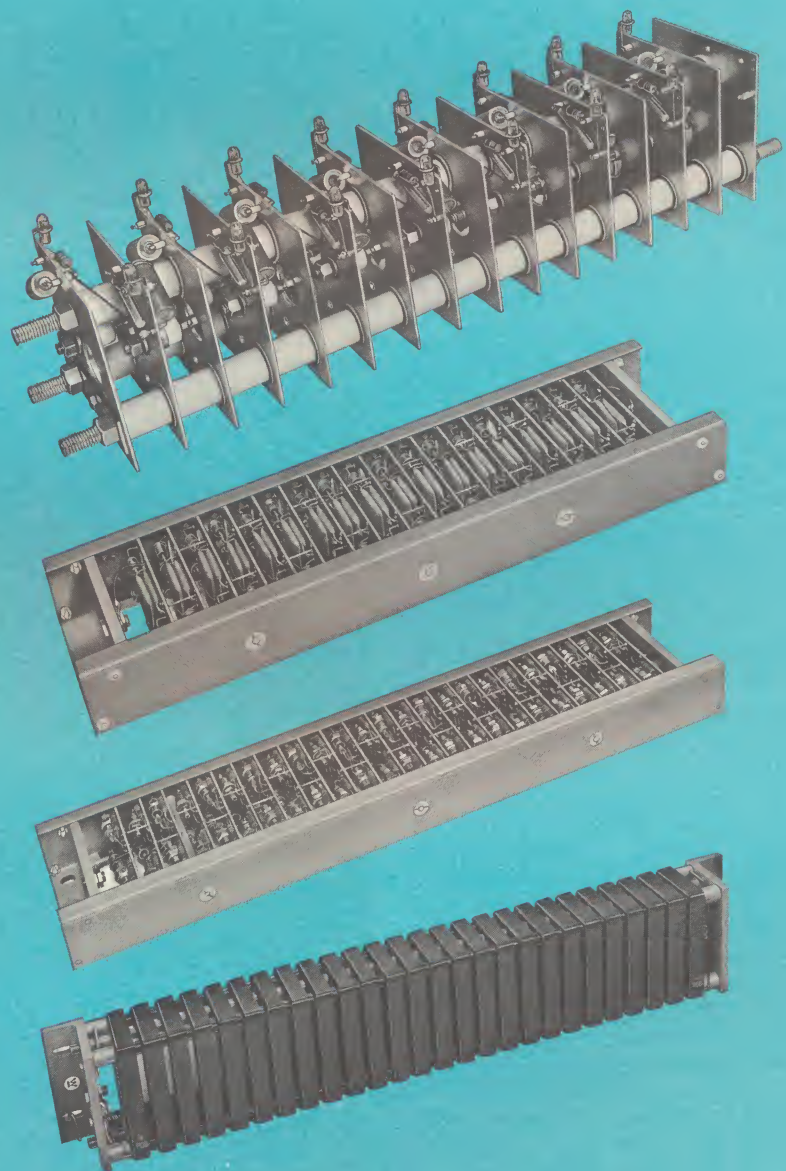
High Voltage Silicon Rectifier Assembly. Single phase up to 3.2 Amps, three phase up to 4.8 Amps, 156 KV. 508C686 & 508C695 Series.

High Voltage Rectifier Assembly. Single phase up to 22 Amps, three phase up to 33 Amps, 78 KV. 508C686 Series.

Encapsulated Silicon Rectifier Assembly. Single phase up to 3.2 Amps, three phase up to 4.8 Amps, 156 KV. 509C915 Series.

LISTED ARE MAXIMUM VOLTAGE AND CURRENTS FOR ASSEMBLIES.
STACKS CAN BE COMBINED IN SERIES OR PARALLEL.

PRV	1 ϕ FW I _{dc}	3 ϕ FW I _{dc}
156K	3.2	4.8
78K	10.0	15.0
78K	14.0	21.0
78K	19.0	28.5
32.5K	31.0	46.5
18K	63.0	94.5
15K	140.0	210.0





behind the Westinghouse Lifetime Guarantee

As the pioneers in the high power field, we at Westinghouse have long recognized a special responsibility in our semiconductor development work. Our initial installations of new products have generally been the first in their respective areas.

Thus, to a large degree, we have always had the burden of developing and proving new applications for the entire semiconductor industry.

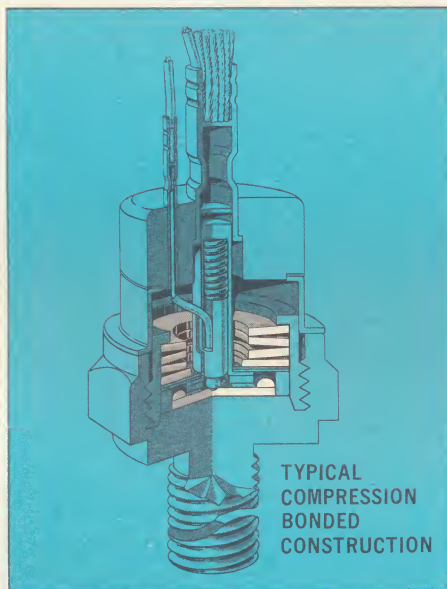
This unique responsibility has meant that all of our engineering, manufacturing and quality assurance efforts must be governed by the concept of total product reliability.

This reliability is not something which can be tested into a product; it must govern every phase of product design, manufacture and application. For example, Westinghouse engineers first recognized and solved the problem of thermal fatigue in power rectifiers.

In applications such as welding, rectifiers are subjected to alternating cycles of heating and cooling which create thermal stresses in the internal diode wafer. If the diodes are assembled with soft solder alloys, the solder joints will eventually weaken and fail.

Our solution was to develop a special brazing process which provides a solid mechanical bond. Extensive load testing then verified that the new process had eliminated the problem of thermal fatigue.

On certain high power SCR's and diodes, a unique compression bond encapsulation is



used. Controlled pressure holds the wafer permanently in place under all thermal cycles, thereby maintaining a constant electrical and thermal bond to the mounting base. Every single Westinghouse high power semiconductor is completely free from thermal fatigue.

The total reliability concept has resulted in devices which simply do not fail in service. Westinghouse semiconductors are the most rugged, dependable units available.

Consider what the reliability level must be for a manufacturer to make this kind of a guarantee. It means complete freedom from downtime and equipment maintenance.

No matter what kind of solid-state equipment you consider, Westinghouse semiconductors offer all the advantages of total reliability.

Design leadership, field-proven dependability and a lifetime guarantee are just a few of the many reasons why we say—in semiconductors, you can be sure... if it's Westinghouse.

for your further assurance the Semiconductor Division operates under many quality specifications to assure conformance to our customer's quality control requirements. Examples of the quality specifications are the following:

MIL-Q-9858A

Quality Program Requirements

NASA 200-3

Inspection System Provision for Suppliers of Space Materials, Parts, Components and Services

MIL-I-45208A

Inspection System Requirements

MIL-STD-453

Military Standard Inspection Radiographic

MIL-C-45662

Calibration System Requirements



This symbol now appears on all semiconductors that carry the Westinghouse Lifetime Guarantee. It means that the device is guaranteed for the life of the equipment in which it is installed. It's the only guarantee of its kind. After two years, no one else has matched it. Consider what the reliability level must be for a manufacturer to offer this kind of guarantee.

The quality that makes this lifetime guarantee possible is the big difference in semiconductors.

Westinghouse Semiconductor Lifetime Guarantee

Westinghouse warrants to the original purchaser that it will correct any defect or defects in workmanship, by repair or replacement f.o.b. factory, for any silicon power semiconductor bearing this symbol  during the life of the equipment in which it is originally installed, provided said device is used within manufacturer's published ratings and applied in accordance with good engineering practice. This warranty shall constitute a fulfillment of all Westinghouse liabilities in respect to said products. This warranty is in lieu of all other warranties expressed or implied. Westinghouse shall not be liable for any consequential damages.

transistors

Silicon Power Transistors	
7.5 amps through 30 amps	4
Alloy "OEM" Transistors	
6 amps through 20 amps	6
Diffused "OEM" Transistors	
7.5 amps through 30 amps	6

thyristors

High Voltage Thyristor Assemblies	7
High Power Thyristor Assemblies	7
Fast Switching Thyristors	
Gate Controlled Switch (GCS)	
Silicon Controlled Rectifiers (SCR)	
10 amps through 300 amps	7
Low Power Thyristors	
10 amps through 16 amps	8
Medium Power Thyristors	
35 amps through 70 amps	8
High Power Thyristors	
125 amps through 300 amps	8

rectifiers

Low Power Rectifiers	
.75 amps through 1.6 amps	10
Medium Power Rectifiers	
5 amps through 70 amps	10
Fast Switching Rectifiers	
1 amp through 35 amps	11
High Power Rectifiers	
70 amps through 500 amps	12
"OEM" Low Cost Rectifiers	
15 amps through 400 amps	12

rectifier assemblies

Single Phase and Three Phase Assemblies	
3.2 through 820 amps	14
Molded Assemblies	
2 amps through 12 amps	16
High Voltage Assemblies	17

Behind the Westinghouse Lifetime Guarantee	18
Technical Assistance	19
Westinghouse Sales Offices	19

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TECHNICAL ASSISTANCE

To assist you in design, single copies of technical data sheets, technical article reprints, and procurement specifications listed below can be obtained from Westinghouse franchised semiconductor distributors, local Westinghouse EC&SP Sales Offices or by ordering direct from Westinghouse Electric Corporation, Semiconductor Division, Marketing Services Dept., Youngwood Pennsylvania 15697.

TECHNICAL DATA SHEETS

Catalog data sheets contain complete design information, maximum ratings, electrical and thermal characteristics, and curves on typical characteristics. These data sheets are identified by a 54-000 file number referenced at the bottom of individual device columns in the Westinghouse 1966 Condensed Catalog.

TECHNICAL REPRINTS

Current published articles which are available are grouped below by device. Please order by reprint number.

Transistors

- R-6369 10KW Sonar Amplifier
R-6191 What About Burn-In?

Thyristors

- SA-9649 How to Ruin SCR's
R-6237 Developments Toward Optimizing Power Semiconductor Design
R-6370 Quasi-Square Waveform Drives High-Efficiency Static Inverter
R-6371 Application Report Tristor Controlled Rectifier Single Phase D.C. to A.C. Static Power Inverter
R-6140 Tristor Controlled Rectifiers in Converters, Inverters, and Frequency Changers
R-6372 Tristor Controlled Rectifier Operation in Proportional Control Systems
R-6373 Tristor Controlled Rectifiers Dissipation Calculations
SA-9763 Thyristors in High Voltage Switching Application-Stanford Linear Accelerator
SA-9699 Current Rating Nomogram for type 242 Gate Controlled Switch

Rectifiers

- R-6335 Protecting Silicon Rectifiers from Transient Overload
R-6335 Choosing the Right Silicon Rectifier

General

- R-6374 The Utilization of Heat Sinks with Semiconductor Power Devices
B-6243 Lifetime Semiconductor Guarantee Revolution or Revelation?
R-6252 Semiconductors—Industrial Giants in Small Packages
R-6375 A Fatigue Free Silicon Device Structure
R-6376 Solid State Control and Conversion
R-6377 Here's How To Get Your Money's Worth
R-6378 Are Semiconductors Reliable?
R-6379 Today's Development Report Solid State Electronics: The Impact on Energy Systems Engineering

PROCUREMENT SPECIFICATIONS

These booklets will aid the design engineer in preparing necessary drawings and specifications required for silicon power military procurement specifications on rectifiers, thyristors, and transistors. These documents contain complete information on ratings and Group A, B, and C testing.

Silicon Power Transistors

- B-7952 Types 2N1015 through 2N1015E
Types 2N1016 through 2N1016E
B-9246 Types 2N1809 through 2N1833
Types 2N2109 through 2N2133
B-7951 Types 2N2226 through 2N2229
Types 2N2230 through 2N2233
B-7950 Types 2N2739 through 2N2742
Types 2N2745 through 2N2748
Types 2N2751 through 2N2754
B-7949 Types 2N2757 through 2N2761
Types 2N2763 through 2N2766
Types 2N2769 through 2N2772

High Power Silicon Controlled Rectifiers

- B-9245 Types 220A through 220Z
B-9250 Types 2N3530 through 2N3540
B-9251 Types 2N1792 through 2N1804
Types 2N1909 through 2N1916

High Power Silicon Rectifiers

- B-8870 Types 1N4044 through 1N4056
Types 770ZB and 770ZD
Types 760ZF through 760ZM
B-9252 Types 1N1183 through 1N1190
B-9253 Types 1N1199 through 1N1206
Types 1N3670 through 1N3673

DESIGNERS HANDBOOK

These Westinghouse handbooks for equipment designers provide a handy factual guide to techniques of applying silicon power semiconductors. Various circuits, design criterion, and device performance characteristics are detailed. These publications are available at \$2 each.

- B-7955 High Voltage Silicon Rectifier Designers Handbook
B-7954 Silicon Controlled Rectifier Designers Handbook

EDUCATIONAL FILM STRIPS

These 35 mm film strips with 33 1/3 rpm recorded scripts are designed for a semi-technical audience. They tell how devices operate and how they are used in typical applications. The film strips and records are also reproduced in booklet form. The film, record, and ten copies of the booklet cost \$12.50. Additional copies of the booklet cost 5 for \$1, 15 for \$2, and 100 for \$10. Order direct from Westinghouse Electric Corporation, Visual Communications Dept., Gateway Bldg. #3, Room 21-North, Pittsburgh, Pennsylvania 15230.

- FS1121 "Semiconductors in Action"
Film includes rectifiers and thyristors.
FS1122 "Silicon Power Semiconductors"
Film includes rectifiers, transistors and thyristors.

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